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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/814,682

03/31/2004

Wen Lin

LIN 13-38

8308

47396

7590

10/31/2007

HITT GAINES, PC

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EXAMINER

MALDONADO, JULIO J

ART UNIT

PAPER NUMBER

2823

NOTIFICATION DATE

DELIVERY MODE

10/31/2007

ELECTRONIC

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket@hittgaines.com

## Office Action Summary

**Application No.**

10/814,682

**Applicant(s)**

LIN ET AL.

**Examiner**

Julio J. Maldonado

**Art Unit**

2823

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 09 April 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 21,23-27 and 37-40 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 21,23-27 and 37-40 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_.
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_.

**DETAILED ACTION**

1. The rejection as set forth in the office action mailed 12/07/2007 is withdrawn in view of the applicants' amendments filed 04/09/2007.
2. Applicants' cancellation of claims 1-20, 22 and 28-36 is acknowledged.
3. Claims 21, 23-27 and 37-40 are pending in the application.

***Claim Rejections - 35 USC § 103***

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 21 and 23-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ouyang et al. (U.S. 6,319,799 B1, hereinafter Ouyang) in view of the following arguments.

In reference to claims 21, 23-25, Ouyang (Figs.1-2C) teaches a transistor structure including a doped silicon substrate (10); a buried layer (30) made of silicon germanium having the general formula  $\text{Si}_{1-x}\text{Ge}_x$  doped with germanium and boron (Fig.2B); a doped silicon epitaxial layer (34) over said buried layer (30); and a transistor structure (16, 18, 20, 22, 24) formed over said silicon epitaxial layer (34) (Ouyang, column 2, line 22 – column 3, line 65).

Ouyang fails to disclose wherein the boron concentration of the co-doped germanium buried layer ranges from about  $1 \times 10^{15}$  atoms/cm<sup>3</sup> to about  $1 \times 10^{20}$  atoms/cm<sup>3</sup>, a dopant concentration of the doped substrate ranges from about

$1 \times 10^{14}$  atoms/cm<sup>3</sup> to about  $1 \times 10^{15}$  atoms/cm<sup>3</sup>, and a dopant concentration of the doped epitaxial layer ranges from about  $1 \times 10^{14}$  atoms/cm<sup>3</sup> to about  $1 \times 10^{15}$  atoms/cm<sup>3</sup>.

However, the selection of the selected dope ranges is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species to obtain a desired dopant concentration on the substrate, buried layer and the epitaxial layer. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to enable using Ouyang to arrive at the claimed invention.

In reference to claims 26 and 27, Ouyang substantially teaches all aspects of the invention but fails to disclose wherein the co-doped germanium buried layer has a thickness ranging from about 1  $\mu\text{m}$  to about 10  $\mu\text{m}$ , and wherein the doped substrate, co-doped germanium buried layer, and the doped epitaxial layer collectively have a thickness ranging from about 2  $\mu\text{m}$  to about 20  $\mu\text{m}$ .

Notwithstanding, it would have been an obvious matter of design choice bounded by well known manufacturing constraints and ascertainable by routine experimentation and optimization to choose these particular dimensions because applicant has not disclosed that the dimensions are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical, and it appears prima facie that the process would possess utility using another dimension. Indeed, it has been held that mere dimensional limitations are prima facie obvious absent a disclosure that the limitations are for a particular unobvious purpose, produce an unexpected result, or are otherwise critical. See, for

example, In re Rose, 220 F.2d 459, 105 USPQ 237 (CCPA 1955); In re Rinehart, 531 F.2d 1048, 189 USPQ 143 (CCPA 1976); Gardner v. TEC Systems, Inc., 725 F.2d 1338, 220 USPQ 777 (Fed. Cir. 1984), cert. denied, 469 U.S. 830, 225 USPQ 232 (1984); In re Dailey, 357 F.2d 669, 149 USPQ 47 (CCPA 1966).

6. Claims 37-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ouyang ('799) in view of Ramadani et al. (U.S. 7,067,856 B2, hereinafter Ramadani).

In reference to claims 37, 38 and 40, Ouyang (Figs.1-2C) teaches a transistor structure including a doped silicon substrate (10); a buried layer (30) made of silicon germanium having the general formula  $\text{Si}_{1-x}\text{Ge}_x$  doped with germanium and boron (Fig.2B); a doped silicon epitaxial layer (34) over said buried layer (30); and a transistor structure (16, 18, 20, 22, 24) formed over said silicon epitaxial layer (34) (Ouyang, column 2, line 22 – column 3, line 65).

Ouyang fails to expressly disclose wherein said transistor structure further includes interconnects located within interlevel dielectric layers located over transistors, which connect the transistors to form an operational integrated circuit and additional active and passive devices.

However, it is well-known in the art directed to MOS devices that these devices further include interconnects and other active and passive devices located within interlevel dielectric layers located over the transistors, which connect the transistors to form an operational integrated circuit. Further support can be in Ramdani (Figs.7-11 and column 13, line 38 – column 16, line 21). Therefore, it would have been obvious to one of ordinary skill in the art at the

time the invention was made that the device of Ouyang would also include the claimed limitations as is well-known or as supported by the teachings of Ramdani.

The combination of Ouyang and Ramdani substantially teach all aspects of the invention but fails to disclose wherein the boron concentration of the co-doped germanium buried layer ranges from about  $1 \times 10^{15}$  atoms/cm<sup>3</sup> to about  $1 \times 10^{20}$  atoms/cm<sup>3</sup>, a dopant concentration of the doped substrate ranges from about  $1 \times 10^{14}$  atoms/cm<sup>3</sup> to about  $1 \times 10^{15}$  atoms/cm<sup>3</sup>, a dopant concentration of the doped epitaxial layer ranges from about  $1 \times 10^{14}$  atoms/cm<sup>3</sup> to about  $1 \times 10^{15}$  atoms/cm<sup>3</sup>, and wherein said buried layer has a germanium concentration ranging from about  $2 \times 10^{20}$  atoms/cm<sup>3</sup> to about  $7 \times 10^{20}$  atoms/cm<sup>3</sup>. However, the selection of the selected dope ranges is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species to obtain a desired dopant concentration on the substrate, germanium layer and the epitaxial layer. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to enable using the combination of Ouyang and Ramdani to arrive at the claimed invention.

### ***Response to Arguments***

7. Applicant's arguments filed 04/09/2007 have been fully considered but they are not persuasive.

Applicants argue, "...Ouyang does not disclose a doped germanium buried layer that has a co-doped germanium buried layer that has a dopant concentration ranging from about  $1 \times 10^{15}$  atoms/cm<sup>3</sup> to about  $1 \times 10^{20}$  atoms/cm<sup>3</sup>

located over a doped substrate where the doped substrate has a dopant concentration ranging from about  $1\text{E}14$  atoms/cm<sup>3</sup> to about  $1\text{E}15$  atoms/cm<sup>3</sup>. Nor does Ouyang disclose a doped epitaxial layer located over the co-doped germanium layer where the doped epitaxial layer has a dopant concentration ranging from about  $1\text{E}14$  atoms/cm<sup>3</sup> to about  $1\text{E}15$  atoms/cm<sup>3</sup>...”.

In response to the applicants' arguments, as stated hereinabove, the selection of the selected dope ranges is obvious because it is a matter of determining optimum process condition by routine experimentation with a limited number of species to obtain a desired dopant concentration on the substrate, buried layer and the epitaxial layer. Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to enable using Ouyang to arrive at the claimed invention. Generally, differences in concentration or temperature will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such concentration or temperature is critical. “[W]here the general conditions of a claim are disclosed in the prior art, it is not inventive to discover the optimum or workable ranges by routine experimentation.” In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). See MPEP 2144.05, IIA. The applicants did not address how one of ordinary skill in the art at the time the invention was made would not arrive at these implantation doses and how these implantation doses would result in an unexpected result.

### ***Conclusion***

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Applicants are encouraged, where appropriate, to check Patent Application Information Retrieval (PAIR) (<http://portal.uspto.gov/external/portal/pair>) which provides applicants direct secure access to their own patent application status information, as well as to general patent information publicly available.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to examiner Julio J. Maldonado whose telephone number is (571) 272-1864. The examiner can normally be reached on Monday through Friday.



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11. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Matthew Smith, can be reached on (571) 272-1907. The fax number for this group is 571-273-8300. Updates can be found at <http://www.uspto.gov/web/info/2800.htm>.



Julio J. Maldonado  
October 24, 2007

Julio J. Maldonado  
Patent Examiner  
Art Unit 2823



GEORGE R. FOURSON  
PRIMARY EXAMINER